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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

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1	1	Cog./Proj. Eng. Mgr. K. R. Fecht		3/10/92		IRM CLEARANCE			H4-17	3	
1	1	QA W. R. Thackaberry		3.9.92							
1	1	Safety D. Hess		10 Mar 92							
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INFORMATION RELEASE REQUEST

References: WHC-CM-3-4

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- [ ] Thesis or Dissertation
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Other Program	[ ]	[X]			
References Available to Intended Audience	[X]	[ ]	B. A. WILLIAMS	B A Williams	3/13/92
Transmit to DOE-HQ/Office of Scientific and Technical Information	[ ]	[X]			

Information conforms to all applicable requirements. The above information is certified to be correct.

Author/Requestor (Printed/Signature) Date: B. A. WILLIAMS 3/13/92

Responsible Manager (Printed/Signature) Date: K. R. FECHT 3/13/92

Intended Audience

[ ] Internal [ ] Sponsor [X] External

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Date Received 3/13/92

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1. Total Pages 45

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7. Abstract

The Odex Test Plan will evaluate the ability to drill State compliant groundwater monitoring wells at Hanford. Objectives and test criteria outlined in this plan provide the guidelines for meeting the requirements for well installations.

APPROVED FOR PUBLIC RELEASE
V. Birkland 3/23/92

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3

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1.0 INTRODUCTION

This plan is an instruction for the investigation and data requirements necessary to evaluate the usefulness and applicability of utilizing Odex drilling methods to construct compliant groundwater monitoring wells on the Hanford Site.

2.0 OBJECTIVES

The objective of the test is to demonstrate improvement in the economic efficiencies of installing Resource Conservation and Recovery Act (RCRA) compliant groundwater monitoring wells with quality maintained. Specifically, this test will evaluate: (1) efficiency and cost effectiveness, and (2) the ability to obtain quality site characterization data during well construction.

3.0 SCOPE

Odex drilling will be evaluated by installing a minimum of three CY 1992 RCRA groundwater monitoring wells. This equipment will be supplied and maintained by the construction contractor for the demonstration. The project engineer will provide direction to the contractor to proceed with the test when all applicable documentation, site preparation, and equipment is in place as outlined in the latest revision of the *Generic Well Specification* (WHC 1991).

4.0 DESCRIPTION OF TEST

4.1 TEST ITEM

The test is designed to evaluate the applicability and efficiency of the Odex drilling system for the construction of RCRA groundwater monitoring wells. The Odex is an air-circulating, top-drive rotary drilling method with a downhole air hammer and rotary percussion bit assembly. The system allows the wellbore to be cased simultaneously with drilling. The test evaluation will include:

- The ability of the Odex drilling method to drill and install RCRA compliance wells
- Comparison of drilling time of Odex vs. 1991 Kaiser Engineers Hanford (KEH) RCRA drilling time
- Comparison on manpower support requirements of Odex vs. 1991 KEH RCRA drilling
- Comparison of the relative development times and volumes of water produced for an Odex wells vs 1991 KEH RCRA wells.

4.2 TEST LOCATION

The test will take place at a minimum of three locations on the Hanford Site (see Figure 1). Two wells, 299-W6-11 and 299-W6-12, are located at the north end of Waste Management Area 5 of the Low-Level Burial Grounds in 200 West Area. The third well, 299-E35-44, is south of the Grout Treatment Facility, which is directly east of 200 East Area (see Figures 2 and 3). The expected stratigraphic sequence for the test wells in 200 West Area is listed below in descending order:

- Hanford Formation
  - mixed gravel (open framework) and sand unit
- Ringold Formation
  - early Palouse/Plio-Pleistocene-calcic silty sandy unit
  - partially indurated pebble to cobble gravel unit
  - quartzo-feldspathic sand and silt unit

The expected stratigraphic sequence for the test well just outside 200 East Area is listed below in descending order:

- Hanford Formation
  - basaltic sand unit
  - pebble to cobble gravel (open framework)
- Ringold Formation
  - partially indurated gravel unit

The assessment of geologic and chemical data from wells adjacent to the test locations, as well as available groundwater data, indicate that there is no radiologic or hazardous waste contamination present in the vicinity of the test locations.

Additional testing of the Odex system at other locations on the Hanford Site will be considered.

4.3 EQUIPMENT

The equipment necessary for the completion of this test will be as follows:

- Odex tools, top-drive rotary rig and air supply system
- Cyclones and drill cutting containment system
- Penetration rate and downtime chart recorder (see Appendix A)
- Other equipment normally onsite to support drilling activities.

4.4 DATA COLLECTION AND EVALUATION

Data for evaluating the performance criteria (listed in Section 4.5) will be compiled from penetration rate logs, Daily Field Activity Reports, geological and geophysical logs as per Environmental Investigation Instruction (EII) (WHC 1988) and Generic Well Specification (WHC 1991). The 200 West Area was chosen as the test location for two wells. It is known as a difficult area for drilling and casing extraction, and will present a significant test of the Odex capabilities. Maximum penetration rates will be evaluated at the test location in the 200 East Area, which is known to contain a thick sand interval.

The potential for drilling through lost circulation zones will be tested in open framework gravels. During drilling, samples will be collected continuously in a sample tube located under the sample cyclone (Figure 4). Cuttings will be examined and preserved in 5-ft increments as per specifications. The drilling system will also be tested for the ability to drive and retrieve a split tube or other sampler for exact lithologic characterization. A minimum of one split spoon will be taken in each test well. Comparison of cutting descriptions, penetration rates, and geophysical logs will be correlated with adjacent wells to determine if relevant geologic/hydrologic criteria have been observed.

Data for evaluating average drilling rates will be compiled from penetration and downtime records, and Daily Field Activity Reports. This data will be compared with KEH activities during the installation of RCRA groundwater monitoring CY 1991 wells.

Data for evaluating manpower support will be gathered by tracking the number of personnel working on location, as recorded on the Daily Field Activity Reports. This data will compare with KEH RCRA 1991 activities.

Data to evaluate well development will be documented on the Daily Field Activity Reports and the Well Development Form. This data will be compared with time and volume comparisons for cable tool well development.

4.5 TEST PLAN CRITERIA/CONSTRAINTS

Listed below are the performance criteria that will determine the ability to drill and construct RCRA groundwater monitoring wells with Odex. The evaluation will be based on these criteria and by comparing Odex and cable tool results. The cable tool data will be from CY 1991 RCRA drilling.

- Ability to physically penetrate Hanford Site formations with minimum disturbance to in-situ soils (e.g., minimize overproducing cuttings)
- Ability to penetrate at an acceptable drilling rate
- Ability to construct well to desired depth/diameter and to install standard RCRA well components and assemblies
- Ability not to over drill more than 2 ft below design depth

- Ability to segregate perched water or contaminated intervals by sealing and/or downsizing casing (e.g., to prevent cross contamination between aquifers)
- Ability to identify lithologies of all formations
- Ability to obtain representative sediment samples to determine physical and chemical soil hydrogeological parameters (e.g., grain size distribution, water content, calcium carbonate content, and possibly sediment contamination) at intervals of 5 ft or at changes in lithology
- Ability to perform geophysical logging
- Ability to contain formation fluid and drill cuttings
- Ability to minimize fluid losses and gains to and from the formation
- Ability to prevent potential contaminants entrained in the compressor air from contaminating the groundwater and soil
- Ability to measure water levels during drilling
- Ability to remove all temporary casing and shoes.

For the purpose of this test all pertinent and relevant governing documents and regulations will be followed. Applicable documents relevant to the field testing of the Odex are given in Section 13.0.

5.0 EXPECTED RESULTS

Success of the four categories outlined in Section 4.1 will be determined by evaluation of drilling performance as outlined in Section 4.5. Each category will be evaluated based on the ability to satisfy current operating and performance standards, and governing regulations. The results from the Odex evaluation will be compared with cable tool performance. The baseline for cable tool performance will be determined from 1991 KEH RCRA drilling. Recommendations on the applicability of utilizing Odex at the Hanford Site will be outlined with the final evaluation.

6.0 TEST PROCEDURE

The test comprises drilling and completing a minimum of three RCRA wells with the Odex drilling system. The test will be performed under existing guidelines as outlined in Section 4.0. Field records will provide the data for evaluation of the test performance criteria. Drilling will be conducted by the contractor and all field activities and pertinent documentation will be overseen by Westinghouse Hanford Company (Westinghouse Hanford) personnel.

7.0 SAFETY

Overall site safety is addressed by the site specific safety plans for the areas in which the wells will be drilled. The safety evaluation and requirements for the Drill Cutting Containment System has been addressed previously (WHC 1990 and Appendix B). In addition, the Odex system test has been addressed and approved by Westinghouse Hanford Safety as shown in Appendix C. For the purposes of safety all test personnel will have stop work authority for safety and operational concerns.

8.0 QUALITY ASSURANCE

Quality assurance shall be in accordance with the *Project Specific Quality Assurance Plan for Groundwater Monitoring Wells* (WHC 1989). Kaiser Engineers Hanford Company shall implement and operate to the provisions specified in *Kaiser Engineers Hanford Generic Quality Assurance Program Plan for Drilling Construction Activities* (KEH 1991).

9.0 ORGANIZATION AND FUNCTION RESPONSIBILITIES

Organizations responsible for implementation of this test drilling activity are as follows:

- Westinghouse Hanford Projects--The Project Engineer is responsible for project logistics, daily drilling and technical operation decisions relative to KEH and the drilling subcontractor
- Westinghouse Hanford Geosciences Group--The RCRA Cognizant Engineer and RCRA Field Geologist are responsible to enforce documentation per WHC (1991) of activities on the appropriate forms, as outlined by WHC (1988), and technical decisions concerning drilling requirements relevant to RCRA compliant wells
- Westinghouse Hanford Health Physics is responsible for site radiation monitoring
- KEH is responsible for implantation of the subcontract for the Odex Drilling Company, the Site Specific Safety Plan and the Site Safety Officers
- Jensen Drilling is responsible for fulfilling the subcontract commitments to KEH/Westinghouse Hanford.

10.0 SCHEDULE

See Appendix D.

11.0 REPORTS

A final report evaluating the four main areas of testing and the conclusions derived from the evaluation will be prepared as per the schedule (see Appendix D).

12.0 DATA SHEETS

All data for documentation of the test will be recorded on the following documents: (see Appendix A)

- Daily Field Activity Report
- Borehole Log
- Well Development Form
- Penetration Rate Chart/Downtime Chart-Geologic Strip Chart
- Drill Log/Rig Activity Sheet
- Well Summary Sheet
- Well Construction Report
- Geophysical Logs.

13.0 REFERENCES

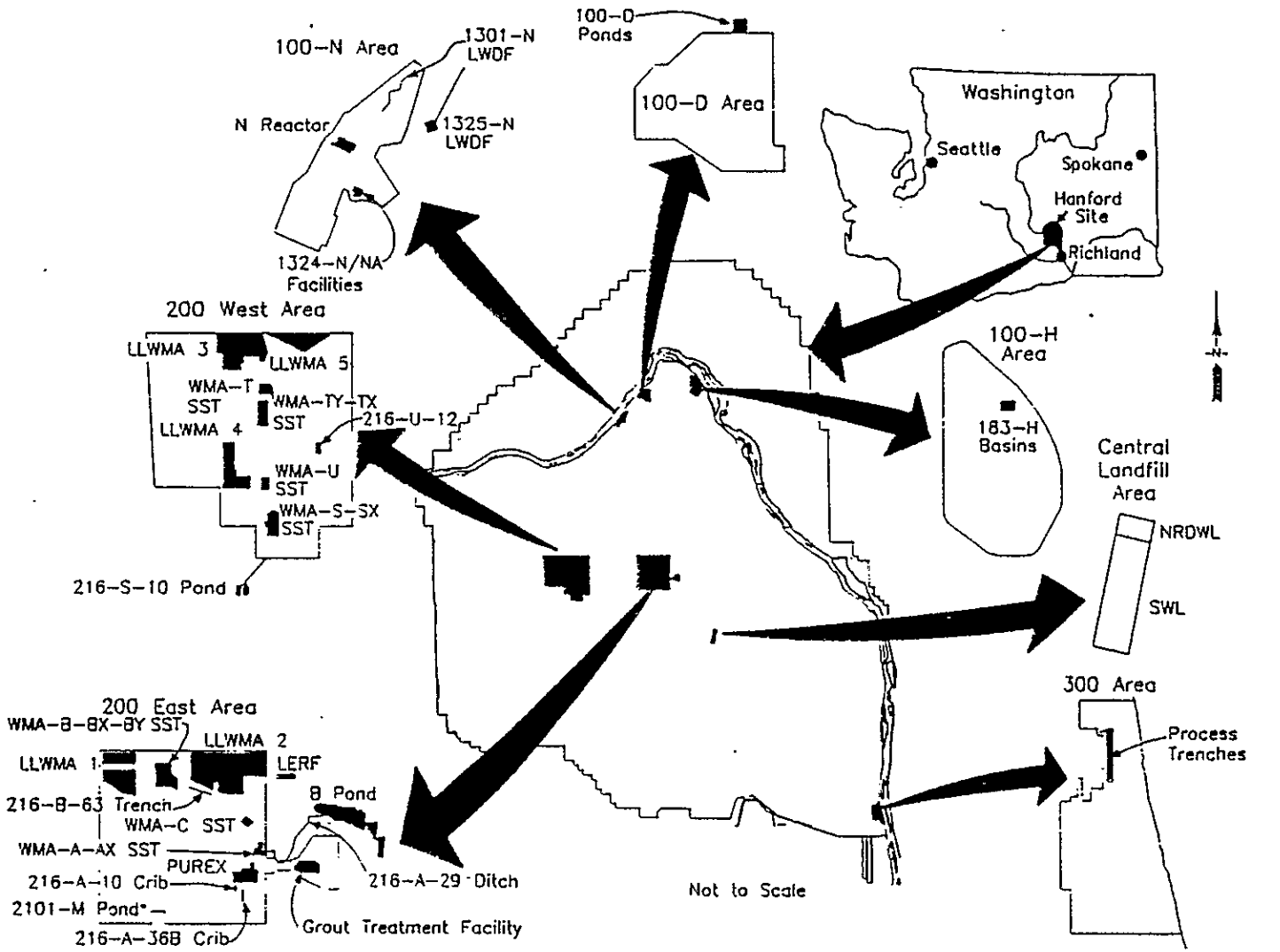
KEH, 1991, *Kaiser Engineers Hanford Generic Quality Assurance Program Plan for Drilling Construction Activities*, No. 27, Rev. 9

WHC, 1988, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1989, *Project Specific Quality Assurance Plan for Groundwater Monitoring Wells*, WHC-SD-WM-QAPP-002, Rev. 1, Westinghouse Hanford Company, Richland, Washington.

WHC, 1990, *Results of Testing the Dual Wall Percussion Hammer Method and Drill Cuttings Containment System at the Hanford Site*, WHC-SD-WM-TRP-042, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991, *Generic Well Specification*, WHC-S-014, Rev. 6, Westinghouse Hanford Company, Richland, Washington.



LERF	Liquid Effluent Retention Facility	PUREX	Plutonium–Uranium Extraction (Plant)
LLWMA	Low-Level Waste Management Area	SST	Single-Shell Tank
LWDF	Liquid Waste Disposal Facility	SWL	Solid Waste Landfill
NRDWL	Nonradioactive Dangerous Waste Landfill	WMA	Waste Management Area

GEOSCI\110890-8

Figure 1. Hanford Site Map.

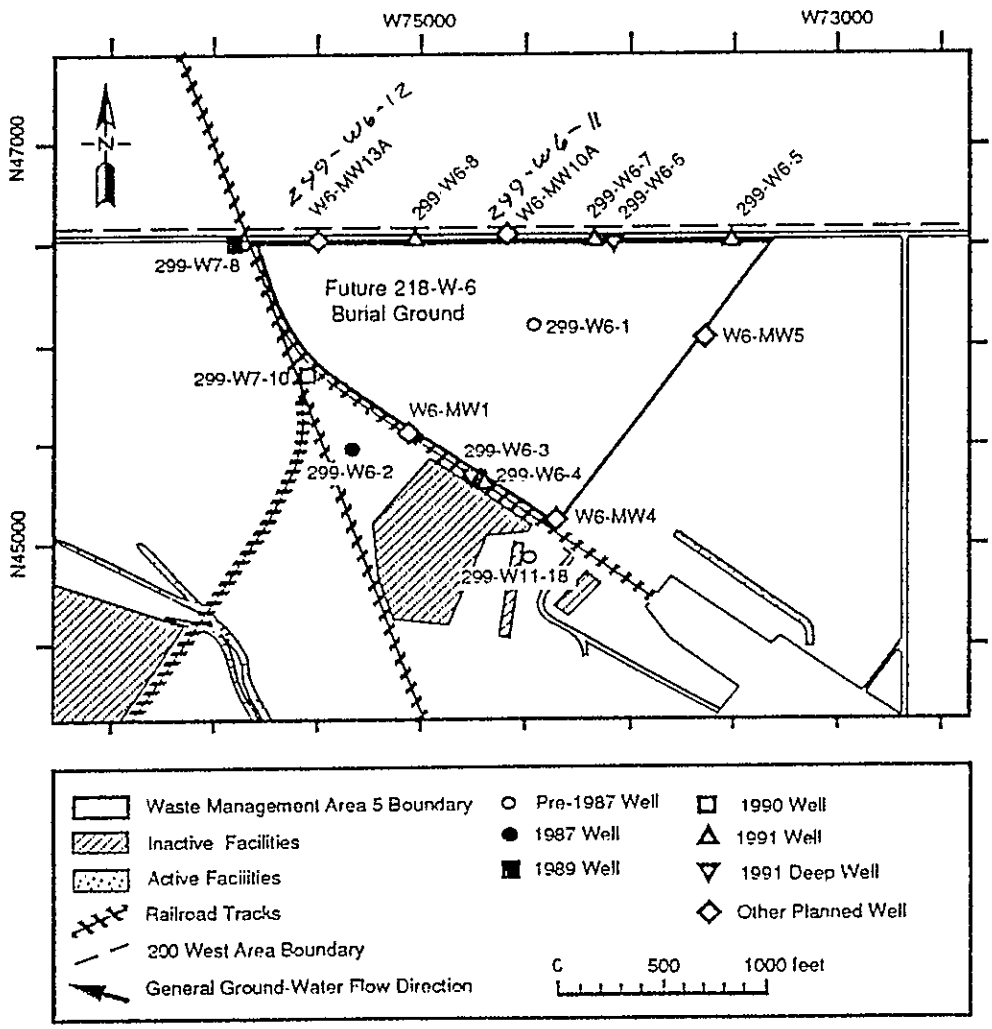


Figure 2. Locations of Low-Level Burial Ground Wells 299-W6-11 and 299-W6-12.

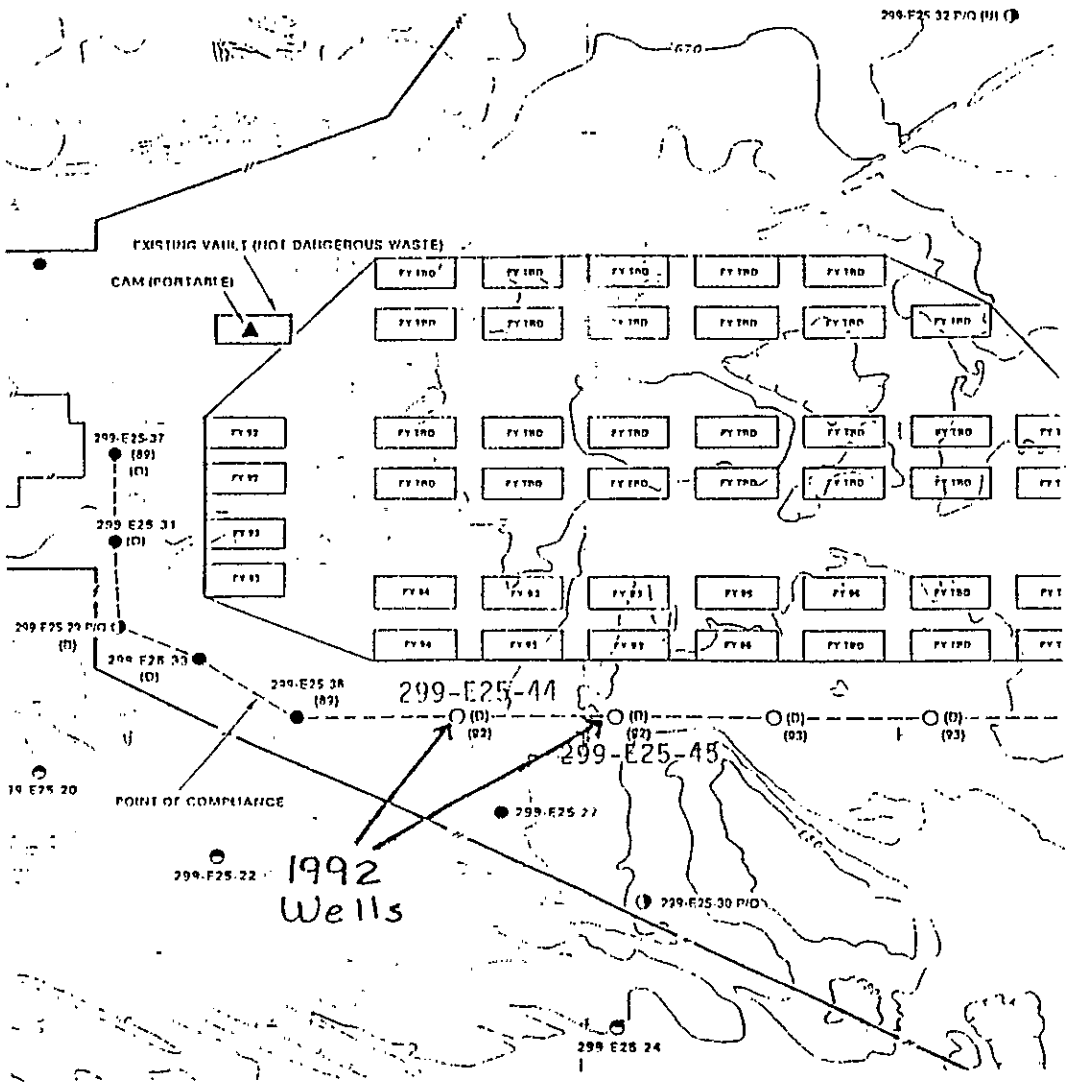


Figure 3. Location of Grout Facility Well Number 299-E25-44.

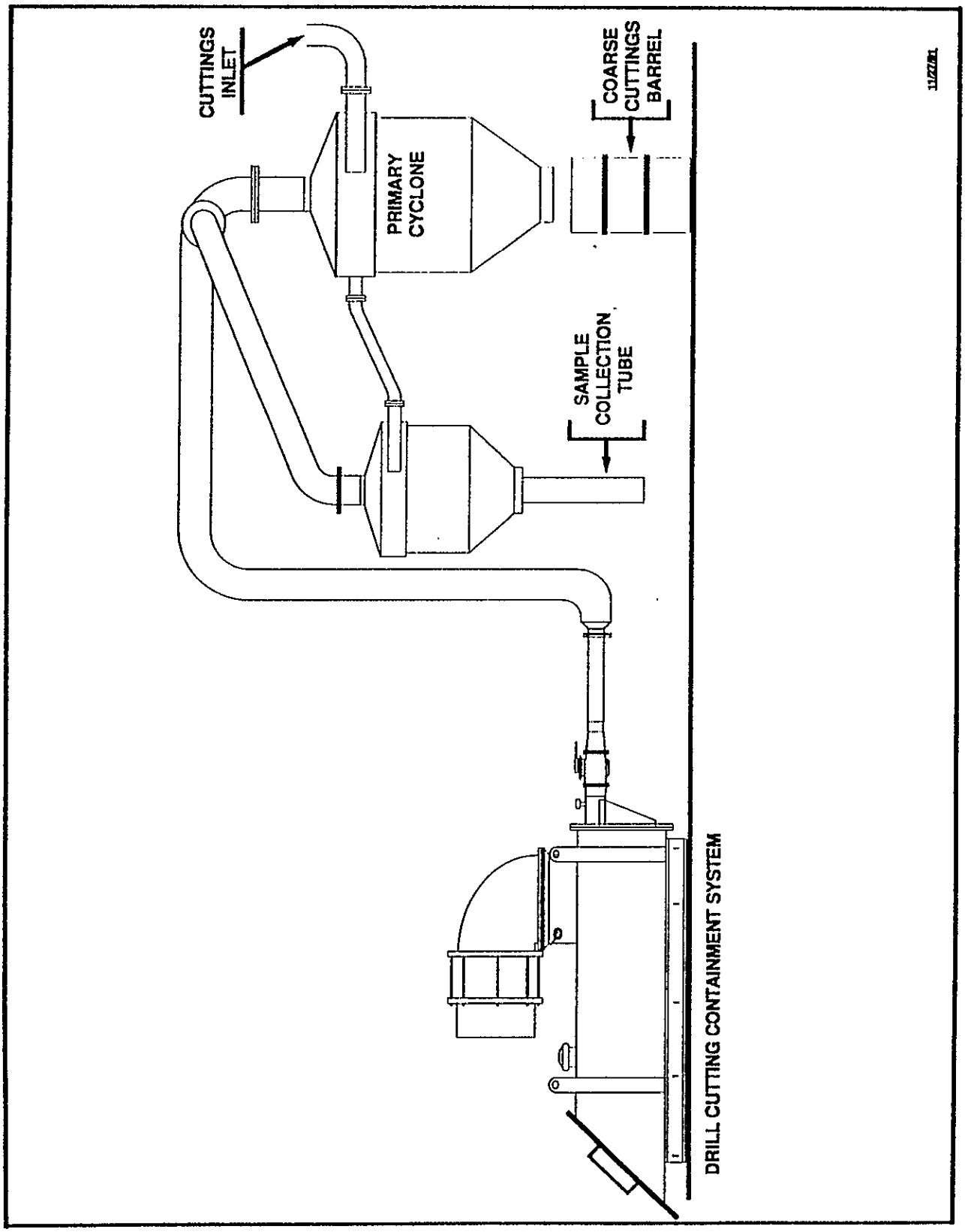


Figure 4. Cyclone and Cutting Containment System.

APPENDIX A

ODEX TEST DOCUMENTATION

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FIELD ACTIVITY REPORT – CABLE TOOL RIG

Page 1 of ___

Date	Well No	Rig Model	Rig No	Contract/Work Order No.	Start Card No	Report No

Purpose	Reference	Location

Casing Size	Set At	Type	Shoe Size	Casing Start Depth	Casing End Depth
				Depth Started	Depth Ended
Reference/Measuring Point				Total Shift Footage	

Start Time _____
End Time _____
Time _____
Contractor Time _____
Total Time _____

Materials Used	Contract Line Items	Personnel
		Operator _____ Lic No. _____ Print & Sign Name (Acceptance) Other:

Depth (feet) From	Depth (feet) To	Drilling Method HT DB ST	Description of Operations/Remarks

Report By _____
Title _____
Signature _____

Reviewed By _____
Title _____ Date _____
Signature _____

Distribution: White – Group File Custodian Yellow – Group Files Pink – Project Coordinator Goldenrod – Team Leader BC-6000-290 (02/90)

DRILL LOG / RIG ACTIVITY REPORT SHEET 2

PROJECT or W. O. NO. _____ SUBCONTRACT NO. _____ COMPUTER NO. _____ SHIFT : _____

DATE: _____ WELL NO. _____ RIG NO. _____ LOCATION: _____ DRILLER: _____

START DEPTH: _____ END DEPTH: _____ FOOTAGE: _____ R.O.P. _____ DAYS on WELL: _____

CURRENT ACTIVITY: _____

==========

CURRENT BIT [ ] - HARD TOOL [ ] - DRIVE BARREL [ ]

BIT SIZE: _____ MFG. _____ SER. NO. _____ TYPE: _____ NEW / RERUN

BIT IN : _____ BIT OUT: _____ FTG. RUN: _____ R.O.P. _____ SCRAP / REUSABLE

BIT CHANGE [ ] - HARD TOOL [ ] - DRIVE BARREL [ ]

BIT SIZE: _____ MFG. _____ SER. NO. _____ TYPE: _____ NEW / RERUN

BIT IN : _____ BIT OUT: _____ FTG. RUN: _____ R.O.P. _____ SCRAP / REUSABLE

==========

ACTIVITY	HOURS	STARTING TIME	ACTIVITY	HOURS
DRILLING:			SAMPLING:	
SAFETY MEETINGS:			W.O. SAMPLERS:	
BAIL HOLE:			LOGGING:	
SERVICE RIG:			W.O. LOGGERS:	
W.O. FUEL / SERVICE:			DECON EQUIP.	
W.O. SITE SAFETY OFFICER			DECON CSG.	
W.O. GEOLOGIST:			STEAM CLEANING:	
W.O. HPT:			W.O. WATER:	
LOST TIME Q.A.			W.O. TOOLS / MATERIAL:	
W.O. DIRECTION:			W.O. SAFETY EQUIP:	
MECH. BREAKDOWN:			OTHER:	
W.O. MAN HAUL:		ENDING TIME	OTHER:	
OTHER:			TOTAL SHIFT HOURS (8)(10):	

==========

	CSG. SIZE	FEET	HOURS		CSG. SIZE	FEET	HOURS
RUN:				B. PULL:			
RUN:				B. PULL:			
RUN:				B. PULL:			
RUN S.S.				B. PULL:			

==========

HEPA	DEMISTER	FTG	HEPA	DEMISTER	FTG

==========

COMMENTS _____

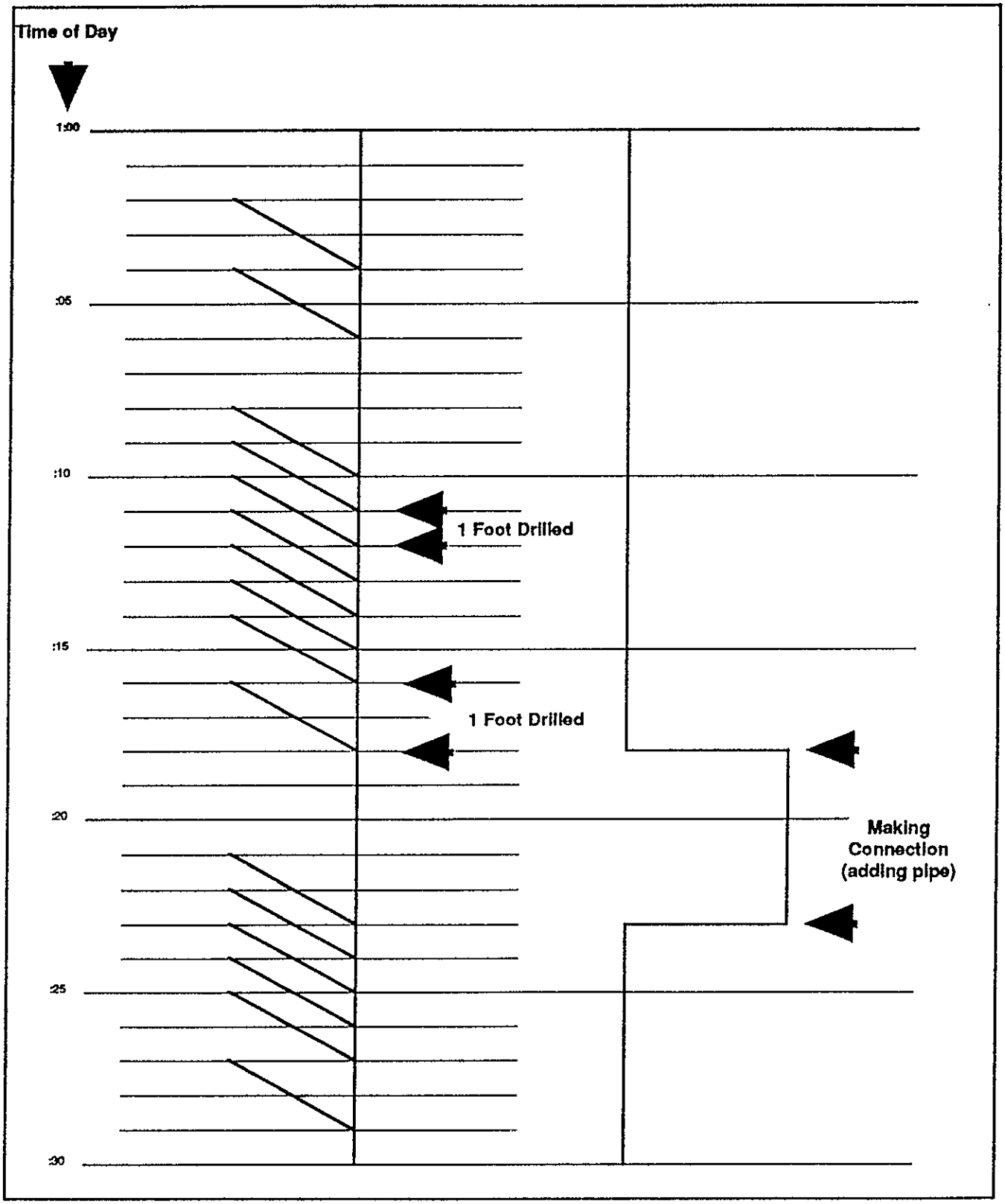
_____

_____

_____

_____ APPROVAL _____

TYPICAL GEOLOGRAPH STRIP CHART



BOREHOLE LOG

Boring or Well No.

Sheet _____ of _____

Location _____ Project _____

Elevation _____ Drilling Contractor _____

Driller _____ Drilling Method and Equipment _____

Prepared By _____ (Sign/Print Name) Date _____ Reviewed By _____ (Sign/Print Name) Date _____

Depth ( )	Sample		Graphic Log	Sample Description	Comments
	Type and No.	Blows or Recovery		Soil Classification, Particle Size Distribution, Color, Moisture Content, Sorting, Angularity, Mineralogy, Reaction to HCl.	Depth of Casing, Drilling Rate, Casing Size & Type, Bit Size, Water Level

WELL DEVELOPMENT FORM

Page _____ of _____

Well Designation _____ Well Depth _____

Screened Interval _____ Date Well Development is Performed _____

BAILING

Water Level Prior to Bailing _____ Time of Measurement _____

Volume of Bailer _____ Number of Bails Removed _____ Gallons _____

Summary Description of Water Removed _____

Water Level After Bailing _____ Time of Measurement _____

SURGE BLOCK

Type of Surge Block _____ Dimension of Surge Block _____

TD BEFORE	STROKE LENGTH	STROKE FREQUENCY	SURGE INTERVAL	SURGE TIME	TD AFTER	TD DIFFERENCE

AIRLIFT

Depth of Eductor Pipe _____ Airlift Start Time _____

Flow Rate _____ Accumulated Flow _____ Airlift Stop Time _____

Turbidity _____, _____, _____, _____, _____, _____, _____, _____

_____, _____, _____, _____, _____, _____, _____, _____

MECHANICAL PUMPING

Pumping Technique _____ Pump Depth _____ Pump Start Time _____

Flow Rate _____ Accumulated Flow _____ Pump Stop Time _____

Turbidity _____, _____, _____, _____, _____, _____, _____, _____

_____, _____, _____, _____, _____, _____, _____, _____

Comments _____

_____

_____

Signature of Recorder _____ Date _____

Sign and Print Name

A-6000-393 (03/90)

WELL SUMMARY SHEET

Boring or Well No.

Sheet _____ of _____

Location _____ Project _____

Elevation _____ Drilling Contractor _____

Driller _____ Drilling Method and Equipment _____

Prepared By _____ Date _____ Reviewed By _____ Date _____
(Sign/Print Name) (Sign/Print Name)

CONSTRUCTION DATA		Depth in Feet	GEOLOGIC/HYDROLOGIC DATA	
Description	Diagram		Graphic Log	Lithologic Description

WELL CONSTRUCTION REPORT

Page 1 of 2

Specification No _____ Rev No _____

ECNs _____

Project _____

Location _____

Drilling Company _____

Driller _____

Other (Companies) _____

Geologist(s) _____

Well No _____ Temp. Well No _____

Coordinates _____

Casing Elev _____ Ground Elev _____

Drilling Method

Verification Method _____

Criteria _____

			Initials	Date
Rotary	Air _____	Mud _____	_____	_____
Cable Tool	D _____	H _____	_____	_____
Drilling Fluid	_____	_____	_____	_____
Other	_____	_____	_____	_____

Geophysical Logging

Sondes	Interval	Date
_____	_____ - _____	_____
_____	_____ - _____	_____
_____	_____ - _____	_____
_____	_____ - _____	_____
_____	_____ - _____	_____

Completion Data

Drilled Depth _____

Completed Depth _____

Date Started _____

Date Completed _____

Static Water Level/Date _____

_____

Aquifer Testing

Type _____

Flow Meter I D No _____

Cal Due Date _____

Length of Test _____

Volume Pumped _____

Drawdown _____

Date of Test _____

Completion Results

Cleaning

Verification Method _____

Criteria _____

	Initials	Date
Drilling Tools/Rig	_____	_____
Temporary Materials	_____	_____
Permanent Materials	_____	_____

Screen

Type	Length	Slot Size
_____	_____	_____
_____	_____	_____

Depth(s) _____ - _____

_____ - _____

Verification Method _____

Criteria _____

Initials _____ Date _____

Material Storage/Packing

Verification Method _____

Criteria _____

	Initials	Date
Mtl Handling/Storage	_____	_____
Material Packing	_____	_____

Lubricants/Additives

Verification Method _____

Criteria _____

	Identify	Initials	Date
Additives	_____	_____	_____
Lubricants	_____	_____	_____

Straightness Test

Verification Method _____

Criteria _____

Initials _____ Date _____

A-6000-436 (09/90)

WELL CONSTRUCTION REPORT
(continuation sheet)

Casing (permanent)

Type	Size	Placement
		–
		–
		–
		–

Verification Method _____

Criteria _____

Initials _____ Date _____

Well Protection

Verification Method _____

Criteria _____

	Initials	Date
Protective Posts		
Protective Casing		
Site Restored		
Cap, Hasp and Lock		
Surface Pad		

Annular Seal/Filter Pack

Verification Method _____ Criteria _____

Type	Interval	Volume	Initials	Date
	–			
	–			
	–			
	–			

Well Survey/Labeling

Verification Method _____

Criteria _____

	Initials	Date
Measurement Point/Surveyed		
Protective Casing/Brass Cap Surveyed		
Well Number Stenciled		
Brass Cap Labeled		

Pump Installation

Verification Method _____

Criteria _____

	Initials	Date
Pump Decon/Prep		
Installed		
Pump Tested		

Other (initial if performed)

_____ Well Abandonment _____ Downhole TV Inspection _____ Complete As-Built Diagram, Driller's/Geologist's Logs

_____ Well Development

Comments/Remarks _____

Reviewed By (Sign/Print Name) _____ Date _____

A-6000-436 (09/90)

APPENDIX B

SAFETY ANALYSIS DOCUMENTATION REQUIREMENTS FOR THE DRILL CUTTING CONTAINMENT SYSTEM TEST

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From: Facility Systems Safety Analysis 33560-89-011
Phone: 3-2073 R3-02
Date: July 24, 1989
Subject: SAFETY ANALYSIS DOCUMENTATION REQUIREMENTS FOR THE DRILL CUTTING CONTAINMENT SYSTEM TEST

To: D. R. Myers H4-54

cc: D. R. Ellingson R3-08
G. L. Kasza H4-56
J. V. Mohatt S0-03
K. J. Moss R3-08
L. D. Muhlestein N1-31
D. D. Stepnewski N1-31
FSSA File/LB

The scope of this letter is limited to design and cold testing in uncontaminated soil.

Activities which represent hazards routinely encountered and accepted by the public are exempt from the requirements for safety analysis defined by WHC-CM-4-46, Nonreactor Facility Safety Analysis Manual. The proposed Drill Cutting Containment System described in the attached safety assessment falls into the exempt category because of the following three characteristics:

1. The activity has no potential to introduce additional hazardous material into the environment. The containment system will control and provide containment of contaminants that may already be present in the soil or water where the well is drilled. The system is designed to provide containment of potentially contaminated soils or water as groundwater monitoring or vadose zone wells are drilled. The system will not be used in areas of known contamination.

2. The containment system will not increase the dispersability of hazardous materials already present in the environment. The system prevents dispersion of potentially contaminated soil or water by capturing the drill cuttings in the waste drum, the sample tube, or the containment tank. The air is discharged through roughing (for dust control) and high efficiency particulate air (for ALARA purposes) filtration.

3. The activity does not concentrate or accumulate hazardous material already present in the environment to any significant degree. Any contaminated materials which may be encountered while drilling are captured and contained. The contaminated materials stay at their original concentrations or are mixed with additional drill cuttings.

D. R. Myers
Page 2
July

33560-89-011

Thus, this activity can be said to represent hazards routinely encountered and accepted by the public, and as such is exempt from the safety analysis requirements of WHC-CM-4-46, including the hazard classification process. Standard industrial safety and fire protection requirements, as well as the radiological protection requirements in application throughout the site are still pertinent, however. Safety review in accordance with the assigned Impact Level 2 (an impact level 2 was assigned in anticipation of future use of the system) is also still in force. Any contaminated materials encountered must be sampled, analyzed, and disposed or according to established procedures. Use of this system in areas of known contamination will require reevaluation.

If you have any questions please feel free to call.

J. P. Hinckley, Manager
Facility Systems Safety
Analysis

iar

Attachment

Concurrences:

A. R. Schade, Manager NFS

R. J. Landon, Manager
Regulatory Analysis 8/23/89

TECHNICAL ASSESSMENT OF THE DRILL CUTTINGS CONTAINMENT SYSTEM

The Environmental Engineering and Technology Function is required to provide the environmental and safety evaluation of the proposed Cuttings Containment System test activity prior to start of the test. The test will involve construction of a groundwater monitoring well utilizing a Dual Wall Percussion Hammer (DWPH) drilling rig in conjunction with the Cuttings Containment System. This technical assessment is intended to address the following concerns:

1. Is there any potential to introduce additional hazardous or radiological material presently in the environment?

2. Will the proposed action increase the dispersability of any hazardous or radiological material presently in the environment?

3. Will the proposed activity concentrate or accumulate significant quantities or radiological or hazardous materials?

The following discussion to addresses these concerns.

CUTTINGS CONTAINMENT SYSTEM

Since the act of drilling does not create contamination but instead allows for access to potentially contaminated earth materials, the Cuttings Containment System will provide a means of preventing the dispersion of contamination during the drilling of boreholes. Dispersion is prevented by removing all drill hole cuttings from the hole-cleaning airstream before the air is released to the environment through a combination of mechanical devices. During drilling, the airstream picks up the cuttings at the bottom of the borehole and transports them to the surface through the dual wall drill pipe. At the surface, the cuttings-laden airstream is conducted through a flexible rubber hose to the cyclone separator. In the cyclone, the coarse cuttings are separated by centrifugal action and fall by gravity into sealed 55 gallon drums. A smaller sampling cyclone, located on the wall of the cyclone separator captures a fraction of the cuttings and directs them into a closed sample tube for later geologic sampling and logging. The airstream, after it passes out of the cyclones, still contains some dust-size particulates. It is next conducted by rubber hose to the cuttings containment unit where the remaining fines settle out and are removed by velocity drop or are captured in either the roughing filter or the HEPA filter. The Cuttings Containment System is totally enclosed and all cuttings are containerized for appropriate disposal.

TEST LOCATION

The location selected for the construction of the test groundwater monitoring well (W 19-30) is in the Hanford 200 West Area, across 16th Street from the Uranium Oxide Plant (Figure 1). The well is in the area between the 216-U-1/2 and 216-U-17 cribs and is part of a project to construct three groundwater monitoring wells to determine the water quality between these cribs. Two wells for the project have recently been completed using cable tool drilling rigs. Both of these wells are on the other side of 16th Street, some 200 feet north of the selected location.

The first well, W 19-28 encountered minor radioactive contamination (up to 400 counts per minute) over a 7 foot interval (35-42 feet below ground surface). The well was completed to 215 feet deep with no other evidence of contamination. The source of this shallow contamination is thought to be the buried pipeline between U-Plant and 216-U-8 crib.

The second well, W 19-29 was located 200 feet east of W 19-28 (down gradient of the groundwater table) and was completed to approximately 217 feet deep without encountering any radioactive contamination.

The location selected for the test well is expected to have very low potential for either radioactive or hazardous waste contamination since the site is down-gradient from any known contaminated areas and is located far from any potential sources of contamination. A discussion of the site conditions is included in the Operational Groundwater Monitoring Plan, WHC-SD-EN-AP-007.

TEST PROCEDURE

As previously stated, the primary purpose of the test is to determine the effectiveness of the Cuttings Containment System in preventing the introduction of potentially contaminated drill cuttings into the above ground environment during the drilling of groundwater monitoring wells. This test will also provide the opportunity to determine the efficiency of the DWPH drilling method in the Hanford geologic environment. The Cuttings Containment System is adaptable to any of the commercial air-bailing drilling techniques and the use of the selected drilling method will not bias the test results.

The Cuttings Containment System test will be controlled by an approved test plan and will be supervised by the cognizant engineer and the project geologist. As is standard procedure for all drilling operations, the work will be monitored by both a radiation protection technician (RPT) and a representative of Environmental Field Services (Site Safety Officer). Additional monitoring may be requested of Hanford Environmental Health Foundation.

During drilling, engineered barriers are provided by equipment design to prevent the introduction of contamination into the above ground environment. These barriers include a completely enclosed drill cuttings removal system consisting of:

1. Dual wall drill pipe with threaded couplings
2. Heavy gauge rubber hose and specified fittings, valves, and piping
3. Totally enclosed cyclones
4. Sealed, heavy gauge plastic sample collectors
5. Sealed barrels and connectors for containing coarse cuttings
6. Cuttings containment vessel for fine cuttings
7. Instrumented roughing filter and HEPA filter in series.

The design and location of the driller's control console allows for "quick stop" shutdowns of the drilling equipment.

In addition to the above mentioned engineered barriers, the following administrative controls, applied via the test plan, will also aid in mitigating the dispersal of contamination and help satisfy the earlier listed concerns:

1. The location of the test well will be initially tested for contamination with a pilot hole drilled by a government-owned hollow-stem auger. The pilot hole will be drilled at least 100 feet deep to assure that no radioactive contamination will be encountered. The test well will be located within 10 feet of the pilot hole. The test well will be moved if contamination is found at the selected location.
2. Before the start of drilling and at regular intervals the entire Cuttings Containment System will be leak tested with Dioctyl Phthalate (DOP) to assure that there are no leaks in the system and that the HEPA filter is operating as required. All leaks will be sealed before drilling will proceed.
3. The drill cuttings received in the sampling tube will be monitored continuously to determine if radioactive contamination is encountered. The RPT will notify the driller to stop drilling if contamination is encountered.

4. Direct reading instruments will be used during the entire test. The monitoring will involve area-wide as well as point monitoring as dictated by the test plan. A procedure for immediate shutdown by alternate (other than verbal) methods will be instituted. Any member of the test team will be authorized to initiate shutdown in the event that any monitoring or other indication deems it necessary. The types of indicators which will prompt a shutdown include the following:

   - o rapid change in pressure gauge readings.
   - o visual or acoustic indications
   - o any reading 3ppm above background on any organic vapor monitoring instrument
   - o any reading above background on radiological survey instruments
   - o any noticeable leaking in Cuttings Containment System.

The above listed engineering barriers and administrative controls will, if implemented properly, provide the necessary safeguards to prevent significant release to the environment or to mitigate any concentration of material in the Cuttings Containment System.

RESPONSE TO CONCERNS

The following is a point-by-point response to the concerns voiced by the Radiation Safety organization:

1. Is there any potential to introduce additional hazardous or radioactive material into the environment?

   Response: There is no potential to introduce additional contaminants into the environment under the planned test sequence. If any contaminants are located in the immediate vicinity of the test well, they will very likely be determined in the initial auger pilot hole. In the unlikely event that the contamination was missed in the pilot hole and it is encountered approximately 10 feet down-gradient, the already leak-tested Cuttings Containment System should capture any materials prior to shutdown of the drill rig.

2. Will the proposed action increase the dispersability of any hazardous or radioactive material presently in the environment?

Response: Constructing a groundwater monitoring well with a drill rig using the Cuttings Containment System will not increase the dispersability of contaminants since all drill cuttings are contained within a totally enclosed and continuously monitored equipment system. The purpose for conducting the test activity is to verify that the Cuttings Containment System operates as intended. The selected test location will have a minimal chance of being contaminated since a pilot hole will be used to assure that there is no detectable contamination at that location.

3. Will the proposed activity concentrate or accumulate significant quantities of radiological or hazardous materials?

   Response: Any contaminated materials encountered during drilling will be captured in the Cuttings Containment System and will remain in the original concentration of the material or will be diluted by the other earth materials in the containers. However, as stated previously, contamination is not expected since a pilot hole will examine the area before the borehole is drilled.

CONCLUSION

With the application of the controls stated in the test plan, the risk of exposure to contamination during the drilling of the test well is minimized to what should be an acceptable level. In the event that contamination is encountered during the pilot hole drilling, the worst case would involve contaminating one or two government owned auger flights. No other equipment or personnel should be contaminated. The test location would then be moved to a different site with no detectable contamination.

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APPENDIX C

SAFETY DOCUMENTATION FOR THE ODEX DRILLING METHOD TEST

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Westinghouse Hanford Company

Internal Memo

From: Geosciences Group 81230-92-007
Phone: 6-0940 H4-56
Date: March 6, 1992
Subject: SAFETY DOCUMENTATION FOR THE ODEX DRILLING METHOD TEST

To: R. D. Lichfield L6-57

cc: J. E. Auten H5-29
D. O. Hess L6-57
G. L. Kasza H5-29
D. R. Myers H4-14
D. S. Takasumi L4-78
KRF:GLK File/LB

INTRODUCTION

The proposed test of the Odex Drilling Method at Hanford will consist of drilling, installing and completing three groundwater monitoring wells using a commercially available Odex down-hole hammer on a commercially available air-rotary drill rig. Appropriate productivity, quality and safety related criteria will be monitored, measured and documented during the work. This data will be evaluated to determine if the Odex method will satisfy existing safety requirements and RCRA program data quality objectives, and be a cost effective alternative to the Cable Tool Drilling Method.

EQUIPMENT

The drilling equipment to be tested is a commercially available Odex down-hole hammer that will be mounted on the drill pipe of a standard air bailed rotary drilling rig. This hammer provides the force to disaggregate, fracture, and pulverize the earth media to be penetrated and to advance the temporary well casing. Compressed air from a rig-mounted air compressor is used to power the hammer and expel the cuttings from the hole. Concentric dual string drill pipe is used to get the compressed air to the hammer and conduct the cuttings from the hole. The drill rig and all ancillary equipment will be commercially available and standard to the water well drilling industry.

While drilling, the cuttings travel in the compressed air stream up the casing and out through the diverter. The standard well drilling industry practice is that the drill cuttings enter a cyclone separator where the air velocity is reduced and coarse cuttings fall out of the air-stream. These cuttings are normally allowed to form an open pile next to the drill rig since they are non-hazardous. In standard practice, the dust size particulates are carried out of the cyclone in the exhaust air stream. Water misting devices are usually used for dust control.

During the proposed test of the Odex method, the Hanford Drill Cuttings Containment System (DCCS) will be incorporated into the cuttings removal system to capture and contain all drill cuttings. This same DCCS was used and evaluated during the test of the Dual Wall Percussion Hammer Method in 1990 (Appendix 1). The DCCS is comprised of a large cyclone to facilitate separation of the coarse cuttings, 55 Gal. containment drums to hold the coarse cuttings, a smaller cyclone equipped with a sampling tube to capture a fraction of the cuttings for geologic logging and physical sampling, and the cuttings containment box. This containment box employs a drop in air velocity, a rougher/demister filter, and a high efficiency particulate air (HEPA) filter to prevent particulates from entering the atmosphere. The cuttings containment box was built to Nuclear Quality Assurance Level 1 requirements and is qualified as a Low Specific Activity (LSA) component, permitting the containment and transportation of LSA classified material. The HEPA filter will be DOP tested to assure that fine particulates do not escape into the atmosphere.

When the DCCS is employed, cuttings exit the hole in the compressed air stream and travel through the diverter and hose connections into the closed-circuit cyclone separator. In the cyclone, most of the large cuttings fall by gravity into the sealed containment barrels. A small fraction of the coarse material is captured by the sampling cyclone. The exhaust airstream and any entrained fines is then discharged through a hose into the containment box. Entering the expansion chamber of the containment box, a velocity drop occurs which enhances the settling of the fines. The low velocity airstream sequentially passes through the demister/rougher filter and then the HEPA filter before entering the atmosphere. The cyclone separator and sealed containment barrels of the DCCS efficiently capture and contain any formation water that is produced along with the cuttings when drilling below the water table. Water vapor that is entrained in the air-stream coalesces on the rougher/demister filter and is then held in the containment box. The integrity of all components comprising the DCCS will be verified by DOP testing before any hole will be drilled. The effectiveness of the DCCS for preventing the spread of potential contaminants was confirmed in the Dual Wall Percussion Tests (Appendix 1).

TEST WELL LOCATIONS

As mentioned earlier, three sites are proposed for drilling groundwater monitoring wells with the Odex and DCCS equipped drill rig; two sites are on the northern boundary of the 200 West Area at the Waste Management Area 5 and the remaining site is located south of the Grout Facility which is located east of the 200 East Area. Experienced geologic staff from the WHC Geosciences Group have examined the drilling logs and well completion reports for the closest nearby wells and have determined that no radioactive or chemical hazards were detected during the drilling at any of those sites. Due to the fact that no radioactive materials have been

disposed near those sites and this investigation of the adjacent well drilling history, there is very little chance to encounter radioactive or hazardous contamination at the proposed well locations.

The first two wells, 299-W6-11 and 299-W6-12, will be drilled at the Waste Management Area 5 RCRA Facility (Figure 1). Waste Management Area 5 is characterized as a "Future Burial Ground" and as such, no waste has yet been disposed to the facility. The logs and drilling reports from wells (299-) W6-8, W6-7, and W7-8 were examined by an experienced geologist who has determined that no radiation hazard was experienced in any of the adjacent drillholes. The proposed locations are on the fringe of the 200 West Area Carbon Tetrachloride plume and very low traces of carbon tetrachloride have been recognized in the groundwater by laboratory instrumentation. None has ever been detected by the field screening instruments in the breathing zone while drilling or while handling the well development water. It would be extremely unlikely that any Carbon Tet would be recognized during the drilling operations since the large volume of compressed air sent down the hole to power the drilling hammer would effectively dilute and disperse the potential contaminant to below detectable limits.

The remaining well will be drilled at location 299-E25-44 on the south boundary of the Grout Treatment Facility (Figure 2). No radioactive or hazardous contaminants have yet been disposed at Grout. Logs from the drilling of wells 299-E25-27, 299-E25-38, 299-E25-39, and 299-E26-33 have been examined by an experienced geologist and no record of the detection of radioactive or chemical contamination was noted.

CONDUCT OF TEST

As a minimum, all safety, health, and contamination control requirements that are applicable to the current RCRA drilling program will be applied to the Odex test activities. Requirements include 40 Hr hazardous waste worker training for all operator and test personnel, onsite surveillance by a Health and Safety Officer, and radiation monitoring by a Health Physics Technician.

Additional safeguards will include the already described Drill Cuttings Containment System whose containment ability will be verified by tracer testing before starting each drill hole, experienced contractor drilling personnel, and an approved test plan which will allow any of the test personnel to stop the test at any time.

SAFETY DOCUMENTATION

The following issues relating to safety documentation have been reviewed and addressed: (1) compliance to DOE Order 5481.1B, (2) Operational Readiness Review, and (3) compliance to DOE Order 5480.19.

1 - Compliance to DOE Order 5481.1B

A Safety Analysis was issued for the drilling of three boreholes using the DCCS and is attached as Appendix 2. It was determined that the consequences of the drilling activities were well within the radiological risk acceptance guidelines of 0.1 rem offsite dose equivalent and 0.5 rem onsite dose equivalent. The scope of work is similar in that all well sites were located in uncontaminated areas and that the DCCS was used to contain all cuttings generated in the drilling operation.

The potential for radioactive contamination does exist. Exposure will be minimized through several approaches. First, the test activities will be conducted in areas that are known to have a minimal chance for containing contamination. Second, the Drill Cuttings Containment System is a proven approach to preventing the spread of contamination due to a tested filter system. In addition, Monitoring by the Health Physics Technician will detect any contamination as soon as it is brought to the surface. If radioactive contamination is noted, drilling will be suspended. This will limit the amount of radioactive material brought to the surface and thereby limit exposure. A Job Safety Analysis and a Radiation Work Permit will be in place for this activity.

2 - Operational Readiness Review

The following items discuss readiness of personnel, procedures, and equipment.

Personnel: All field personnel are trained to the 40 hr Hazardous Waste Worker requirements and radiation worker specifications. All Personnel are required to read the JSA and the Radiation Work Permit (RWP) prior to field activities. A pre-job safety meeting will be conducted and documented.

Procedures: The test will work to the protocol of WHC-CM-7-7, Environmental Investigations and Site Characterization Manual, especially EII 6.7, Resource Protection Well and Test Borehole Drilling. The work will be performed with an approved work package.

Equipment: Equipment used will be in a safe condition, receive routine maintenance and inspections, and will be operated by personnel who are trained in its use and have used the same equipment in the past to perform similar work.

R. D. Lichfield
Page 5
March 6, 1992

81230-92-007

3 - Compliance to DOE Order 5480.19

The intent of this order will be met through use of WHC-CM-7-7 procedures and other documents such as test and sampling plans, Letters of Instruction, Statements of Work, etc.

Contact Mr. G. L. Kasza at 376-0763 for further information or if there are any questions.

K. R. Fecht, Manager
Geosciences Group

dyl

Environmental Safety Assurance has evaluated this memo and concludes that the safety documentation for the described work meets the intent of the WHC and DOE criteria. Other than the potential for radioactive materials to be involved, the hazards of well drilling are routinely encountered and accepted by the public. A RWP and the limited potential to encounter radioactive material in addition to the use of the Drill Cuttings Containment System for capture of all cuttings generated in the drilling operation provide worker protection and also provide adequate protection of the non-involved onsite personnel and the public.

CONCURRANCE

R. D. Lichfield
Environmental Safety Assurance

Date 3/6/92

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APPENDIX D

ODEX DEMONSTRATION SCHEDULE

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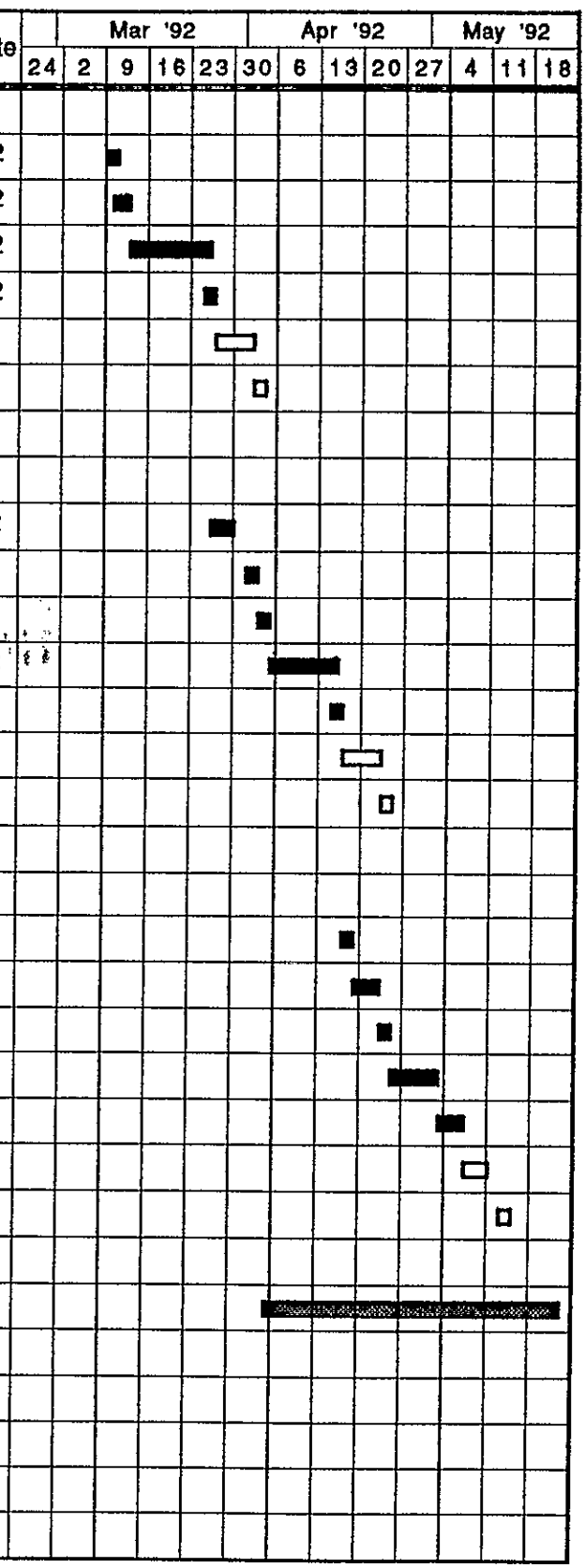
ODEX DEMONSTRATION SCHEDULE 2/3/92

Activities	Start Date	Finish Date
WELL NO. 299-W6-12		
LLBG Well No.1 (Mob/Setup)	3/9/92	3/10/92
LLBG Well No.1 (Shake Down)	3/10/92	3/12/92
LLBG Wello No. 1 (Drl)	3/13/92	3/25/92
LLBG Well No. 1 (Demob)	3/25/92	3/26/92
LLBG Well No. 1 (Bpull/Run SS)	3/27/92	4/1/92
LLBG Well No. 1 (Dev/P&Post)	4/2/92	4/3/92
WELL NO. 299-W6-11		
Service Rig and Equip.	3/26/92	3/29/92
LLBG Well No. 2 (Mob/Setup)	4/1/92	4/2/92
LLBG Well No. 2 (Shake Down)	4/3/92	4/4/92
LLBG Wello No. 2 (Drl)	4/5/92	4/15/92
LLBG Well No. 2 (Demob)	4/15/92	4/16/92
LLBG Well No. 2 (Bpull/Run SS)	4/17/92	4/22/92
LLBG Well No. 2 (Dev/P&Post)	4/23/92	4/24/92
WELL NO. 299-E25-44		
Service Rig and Equip.	4/17/92	4/18/92
GTF Well No. 1 (Mob/Setup)	4/19/92	4/22/92
GTF Well No. 1 (Shake Down)	4/23/92	4/24/92
GTF Well No. 1 (Drl)	4/25/92	5/2/92
GTF Well No. 1 (Demob)	5/3/92	5/6/92
GFT Well No. 1 (Bpull/Run SS)	5/7/92	5/10/92
GFT Well No. 1 (Dev/P&Post)	5/13/92	5/14/92
FINAL REPORT	4/5/92	5/22/92



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